

FIT TO THINK:
CONCEPTUAL, CRITICAL
& CREATIVE THINKING

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Why This is Important

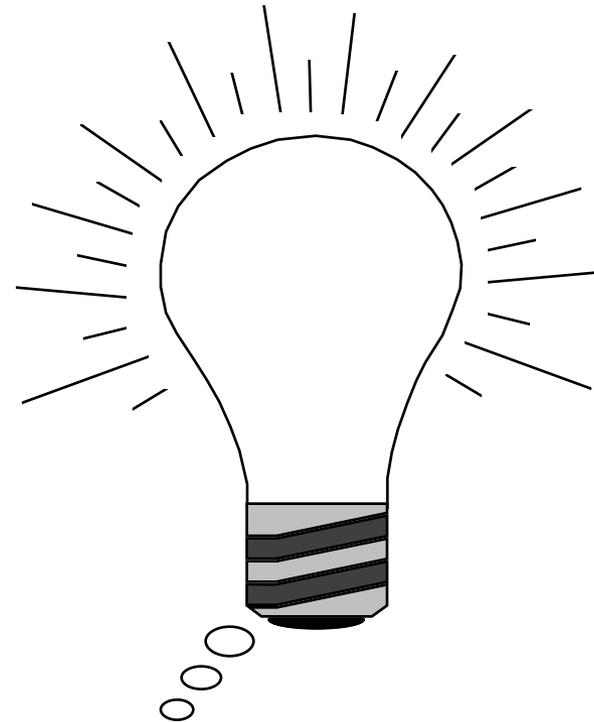
- **Even in combat, how well you think is more important to how well you fight than how physically fit you are**
- **A wrong decision, an unasked question, a forgotten task, an incomplete analysis, or a poor synthesis can kill you**
- **You must exert mental sweat as well as physical sweat to be “Fit to Fight”**
- **Good decisions require good thinking!**

To Think

- To form or conceive in the mind
- To meditate, ponder, analyze or examine
- To have in mind as a plan, intent, or purpose; intend
- To hold as an opinion; believe; suppose
- To reflect upon the matter in question
- To anticipate or expect
- To make a mental discovery

Idea

- any conception existing in the mind as a result of mental understanding, awareness or activity
- a thought, conception or notion
- an impression
- a plan of action; an intention



Why Do We Use A Light Bulb For An Idea?

- **“Let there be light!”**
- **See where there was dark before**
- **Come to know and understand because we can see better...**
- **Who invented the light bulb?**
- **Thomas Alva Edison in 1879**
- **America’s most famous inventor**
- **Light bulb = invention = idea**

Conceptual

- **Pertaining to concepts or the forming of concepts**
- **CONCEPT--**
 - a general notion or idea; conception**
 - an idea of something formed by mentally combining all its characteristics or particulars: a construct**
 - a directly conceived or intuited object**

Why Conceptual Thinking Is Difficult

- We emphasize analysis
 - taking things apart
- Need to emphasize synthesis
 - putting things together
- Must think both ways
- Otherwise, we are “half wits”
- We don’t emphasize it, reinforce it, reward it and practice it

Utility and Value

- **Concepts should be broad enough to be useful**
- **Concepts should be specific enough to be of value**
- **The “Goldilocks Problem”**
- **Like programming**
- **Able to be amended and modified**
- **Not limited by time and place**

Example

- **Government is a concept**
- **It refers to a process, a means of decision making**
- **It is not bounded by time, size, place but links means and ends**
- **It is about both purposes and processes**
- **It permits comparison across cultures**
- **Focuses on how people make rules for living together**

Example

- **Air Power is a concept**
- **What are the attributes of air power?**
- **How is it defined? Measured? Assessed?**
- **There are different kinds of air power**
 - **Purpose** **Performance**
 - **Methods** **Munitions**
 - **Platforms** **Personnel**
- **Concepts can be used in myriad ways**

Critical

- Inclined to find fault or judge with severity
- Occupied with or skilled in criticism
- Involving skilful judgment as to truth, merit, etc.
- Pertaining to or of the nature of crisis
- Involving grave uncertainty, risk, peril, etc.; dangerous

Critical Thinking Is . . .

- **It is easy—almost natural—to criticize**
- **Others!**
- **We can all improve on someone else's ideas, behavior, performance, etc.**
- **Difficult--to do well and effectively**
- **To find root causes of why things are sub-par**
- **Perfection is elusive and there is always room for improvement**

The Two Cultures

- You will be irritated with how critical civilian academics are
- Academics are by nature critical—they are educated by asking hard questions
- Those in the military are trained to be team players
- It is essential to mission effectiveness
- It will be a challenge for many of you to learn how to ask tough questions of yourself and others

Critical Thinking Is . . .

- **Asking Why? Why not? How?**
- **Testing motives, bias, incompleteness**
- **Deals with alternative explanations**
- **Formulation and testing of hypotheses**
- **If ... then statements, and conditions**
- **Looking for mismatches**
- **Pattern recognition**
- **Analysis and synthesis**

Good Critical Thinking

- **Requires ability to assess premises of argument**
- **Premises state the assumptions of logic to follow**
- **They are the starting point of argumentation**
- **If the premises are faulty, then the argument is also**
- **Critical thinking begins with an assessment of the premises**

Kinds of Bad Premises

- **Arguments are fallacious if they are based on the following:**
 - A. Unacceptable premises**
 - Shaky, dubious, inaccurate
 - B. Irrelevant premises**
 - No bearing on truth or conclusion
 - C. Insufficient premises**
 - Do not eliminate reasonable doubt

False Dilemma

- **Either science can explain how a person was cured of a fatal disease or it was a miracle.**
- **Science can't explain how he was cured.**
- **Therefore it was a miracle.**
- **The two alternatives are not exhaustive**
- **Since there are other options, the argument is fallacious**

Equivocation

- **It is the duty of the press to publish news that's in the public interest.**
- **There is great public interest in UFOs.**
- **Therefore the press fails in its duty if it does not publish news about UFOs.**
- **“Public interest” = public welfare**
- **“Public interest” = what public is interested in**
- **Switched meaning invalidates argument**

Composition

- **Subatomic particles are lifeless.**
- **Therefore, anything made of them is lifeless.**
- **Whole may be greater than the sum of its parts.**
- **Emergent properties (water molecule and wetness) are important**
- **Fallacy is assuming that what is true of parts is true of whole.**

Division

- **We are alive.**
- **We are made of sub-atomic particles.**
- **Sub atomic particles are alive.**
- **The converse of the fallacy of composition**
- **What is true of the whole is not necessarily true of the parts.**
- **Components do not equal wholes.**

Appeal to the Person

- You can't believe anything Smith says about the military.
- He's never been in the military.
- Anything he says about it is suspect.
- An argument should stand or fall on its merits, not who proposes it
- Crazy people can make rational statements & sane people non-sense
- You don't have to be a pig to be a pig farmer!

Genetic Fallacy

- **The insight about how molecules arrange themselves came from a vision.**
- **A vision is not a scientific experiment.**
- **Therefore, the snake biting its tail arrangement for benzene molecules is erroneous.**
- **The origin of a claim is irrelevant to truth or falsity.**
- **Depends on evidence supporting it.**

Appeal to Authority

- **Linus Pauling won a Nobel Prize.**
- **Pauling says massive doses of vitamin C prevents colds, increases life expectancy.**
- **Therefore I should take lots of vitamin C.**
- **Appeal to celebrity or famous person is not a proof of contention or endorsement.**
- **May be true but the fact that he says so is irrelevant to proof.**

Appeal to the Masses

- **Everybody I know is taking money out of the stock market.**
- **Because they are doing it, I should too.**
- **Quantity of examples of a behavior is not necessarily proof, just popularity.**
- **("100,000 lemmings can't be wrong!")**
- **Popularity is not a reliable indicator of reality, truth or value.**

Appeal to Tradition

- **Astrology has been around for ages.**
- **Important people believed in its utility—(Caesar, Hitler, the Reagans)**
- **Therefore, there must be something to it.**
- **Fact that an idea has been around for a long time does not mean it is true or that it should be continued.**
- **Slavery was a “tradition” before outlawed.**

Appeal to Ignorance

- **Bigfoot must exist because nobody has been able to prove he doesn't.**
- **Inability to prove one thing does not mean opposite is true—both may be wrong.**
- **Assumes lack of evidence for one thing is good evidence for opposite proposition.**
- **Lack of evidence proves nothing—necessarily.**

Appeal to Fear

- **If you do not convict this criminal, one of you may be the next victim.**
- **What defendant, even if guilty, has done in the past, is not proof of what he/she will do in future.**
- **What someone may do in future does not prove what they did in the past.**
- **Threats extort but don't necessarily promote truth.**

Hasty Generalization

- I know a professor.
- He is more than a bit weird.
- Academics are oddballs and not to be trusted.
- Can't judge a class of people by observing only one—or many.
- Inference is legitimate only if the sample is representative of the class investigated.
- There are usually exceptions to generalizations.

Faulty Analogy

- Astronauts wear helmets and fly in spaceships.
- Figures in Mayan carvings seem to be wearing a helmet and flying in a spaceship.
- Therefore, it is a carving of an ancient astronaut.
- Carvings may bear greater resemblance to ceremonial headdress and fire.
- May make false connections in similarities/dissimilarities.

Faulty Cause

- **Night follows day.**
- **Therefore, day causes night.**
- **Because two events are constantly linked does not mean that one causes the other.**
- **When the US relies on airpower, wars are short.**
- **Therefore, the use of precise airpower causes short wars.**
- **May be other factors involved—causal connection assumed, not proven.**

Argumentation

- **The process of arriving at reasons and conclusions**
- **Involves marshaling evidence in support of valid statements built on sound premises**
- **Mark Twain's caution—the American predilection for confusing law courts and revival meetings**

Objectivity

- **Object (n.)**—1. a material thing; 2. a purpose, end or goal
- **Object (v.)**—to be opposed; to feel or express disapproval
- **Objective**—independent of the mind; real
- **Objectivity**—state or quality of being objective (without bias or prejudice); objective reality

Creative

- Having the quality or power of creating
- Resulting from originality of thought, expression, etc.
- Originative, productive
- CREATE--
 - to evolve from one's own thought or imagination
 - to cause to happen; bring about; arrange as by intention or design

Thoughts On Creativity

- **Creativity is a lot like golf and sex . . .**

(doesn't have to be perfect to be worthwhile)

- **Creativity is rare**
- **Creativity is non-linear, right brain**
- **Creativity is difficult**
- **Creativity breaks boundaries**
- **Creativity embraces novelty**
- **Creativity is play and improvisation**
- **Creativity emphasizes alternatives**

On The Need For Creative Thinking

**“The most indispensable attribute of the
great captain is imagination.”**

General of the Army

Douglas MacArthur

Letter to Liddell Hart, 1959

Your Brain

Left

- one thing at a time
- linear processing
- sequential operation
- writing & symbols
- analysis
- logic & reason
- mathematical
- verbal memory

Right

- integrating inputs
- holistic perception
- dreams
- holistic solutions
- synthesis
- pattern recognition
- intuition, insight
- visualizing

Questions

- **Questions precede answers**
- **Everything is an answer without a question**
- **Questions help discriminate among massive amounts of data**
- **The “need to know principle”**
 - **What do you need to know?**
 - **Why do you need to know it?**

The Importance of Questions

- Comes from Latin *quaerere* (to ask, to seek)
- You are on a quest for meaning and understanding when you read
- If you don't know where you are going, it doesn't matter which road you take
- Know your direction if not your destination when you start your journey

Questions

- **Who, What, Where, When? (Information)**
- **How and Why? (Analysis)**
- **The right questions and the right combination of questions**
- **The right sequence of questions**
- **The questions generated by your questions**
- **Ask “why” five times**

“Only Connect”

- To bind or fasten together; join or unite; link
- To establish communication between
- To have as an associated or accompanying feature
- CONNECTION--
 - association; relationship
 - affiliation, alliance, combination
 - junction, conjunction, union

Why Connections Are Vital

- **Patterns of thought**
 - deductive
 - inductive
- **Extend knowledge by linkages**
 - build bridges from what we do know to what we don't know
 - “from near to far”
- **Neural networks & synapses in our brain work in patterns of random connections**

Your Task

- **“Our challenge in this new century is a difficult one; to defend our nation against the unknown, the uncertain, the unseen and the unexpected.”**

Donald Rumsfeld, Secretary of Defense

Confronting The Future

- **Must become comfortable with**
 - the unknown
 - the unknown unknowns
 - the unknowable
- **Embrace ambiguity**
- **Begin by asking good questions**
- **Accept the tentative, hypothetical**
- **Relish novelty, the mismatches**
- **Enjoy the process**

Analogies

- A partial similarity between like features of two things on which a comparison may be based
- A way of building connections and finding patterns of similarity
 - structures
 - functions
- Types of analogies: personal, direct, symbolic and fantasy

Analogies

- **Personal--imagine you are a wall covering--What fears do you have? What could hurt you?**
- **Development of fire retardant, non-toxic items**

- **Direct--George de Mestral & burrs--How do they cling to clothes, dogs?**
- **Make a great fastener--VELCRO!**

- **Symbolic--Snake swallowing its tail--Friederich von Kekule & benzene molecules**
- **Ring structure of aromatic compounds**

Analogies

- **Fantasy Analogies--You become maker of your own world**
- **Escape hide bound notions and limitations**
 - **Limited only by imagination & creativity**
- **Example--How could navy improve security, reduce costs and minimize risk to human life at sub bases?**
- **Train dolphins--cheap, non-human, better sonar detection, can communicate**

Forced Associations

- **A way of making connections among supposedly disparate items to see what one can learn about each of them and what new combinations may emerge**
- **Examples--**
 - **Animals and weapons systems—**
- **AFRL does this routinely—engineer the organic and make the organic engineered**

Animals & Weapon Systems

- **Turtles--**
 - **Mobile, armored--TANKS**
- **Birds--**
 - **Flight gives height, range, responsiveness--
PLANES**
- **Hummingbirds--**
 - **Can hover, move backward--HELICOPTERS**
- **Bats--**
 - **“see” by sound in darkness--SONAR**

Answers

- **n.—Something said or written in response to a question; the solution to a problem**
- **vt.—to reply to; to respond to a signal; to fulfill satisfactorily**
- **vi.—to reply in words or by action; to react to a stimulus; to serve the purpose, be sufficient; satisfy in detail the question asked**
- **There are no answers without questions—make sure you know what the question is that the answer relates to**
- **Miscellaneous facts are NOT answers**

Thinking & Winning

- **YOUR MIND IS YOUR MOST IMPORTANT WEAPON--**
 - **With a good one, other weapons are more useful, sometimes unnecessary**
 - **With a poor one, other weapons are useless to achieve victory**
 - **You must learn confront the unknown, the uncertain and the unknowable**
 - **Exercise your brain as well as your body**

The Bottom Line— Hammond's Laws

- **You are only as good as your mind--it is your best weapon for survival**
- **Knowledge is a force multiplier and the key to successful adaptation**
- **Learning how to think quickly and well is more important than learning what to think—learn how to learn for yourself**

POINT TO PONDER

“When we fight the next war, I hope we do it from the neck up instead of from the neck down.”

Jimmy Doolittle

So . . .

- **This is no bull—it is central to your competence, regardless of your service, career field, assignment or mission**
- **You must PRACTICE good thinking skills—they don't happen by accident**
- **If you don't do it, it won't get done**
- **If not now, when? If not here where? If not you, who?**

BOOKS ON THINKING

- **Roger van Oech**
 - *A Kick in the Seat of the Pants*
 - *A Whack on the Side of the Head*
- **Michael Michalko, *Thinkertoys***
- **Michael J. Gelb, *How to Think Like Leonardo DaVinci***
- **David Hackett Fischer, *Historians' Fallacies***